



COMBINED REPORT - REVISION 1
Site Characterization
Remedial Investigation
Risk Assessment, Cleanup Plan
Phillips Island
Marcus Hook Refinery
Marcus Hook, Pennsylvania

Prepared for:

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Philadelphia, Pennsylvania
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EXECUTIVE SUMMARY

Sunoco, Inc. (R&M) (Sunoco) retained URS/Dames & Moore to perform a site characterization, remedial investigation and risk assessment and develop a cleanup plan for the Phillips Island site at the Sunoco Marcus Hook refinery. The scope of the site characterization, remedial investigation, risk assessment and cleanup plan was consistent with the intent and requirements of the Pennsylvania Land Recycling and Environmental Remediation Standards Act (commonly referred to as Act 2). The results of these evaluations demonstrate that the site will meet the Act 2 requirements for closure of the site under site-specific standards by engineering controls for pathway elimination.

Phillips Island (the Island) is an area of approximately 27 acres, 21.1 acres of which FPL Energy Marcus Hook, L.P. (FPLE) is considering for occupation. The Pennsylvania and Delaware state border passes through the site. Of the 21.1 acres, approximately 4 acres are located in Delaware.

Sunoco and FPLE are negotiating the construction of a 750-megawatt gas-fired co-generation facility on the Phillips Island portion of the Sunoco Marcus Hook refinery. The co-generation plant will use natural gas as a fuel source. This will reduce the number of boilers in use at the refinery and reduce the overall nitrogen oxide (NOx) and sulfur oxide (SOx) emissions.

The analytical results from the remedial investigation were compared to the statewide health standard soil to groundwater pathway and direct contact exposure medium-specific concentrations to identify chemicals of potential concern (COPCs). Many of the regulated substances were below the medium-specific concentrations and accordingly meet the statewide health standards.

For the surface and subsurface soils, the detection limits for several of the SVOCs were above either the non-residential used aquifer soil to groundwater pathway MSCs or the surface and subsurface direct contact MSCs. To assess the potential for these compounds to be present above the MSCs, these constituents were included in the exposure characterization.

Evaluation of the potential exposure pathways under current and future use scenarios concluded the following:

- There are no potable wells in use at or downgradient of the site. Groundwater ingestion and groundwater dermal contact are not complete exposure routes of concern. The plans for

proposed occupied co-generation project buildings include a passive vapor control system thereby eliminating the potential for future worker exposure inside buildings. Therefore, the groundwater vapor inhalation exposure pathway is not a significant exposure pathway.

- The soil exposure pathway for workers on Phillips Island is through direct contact. In areas of activity, the surface is covered with gravel or paved with concrete. Future plans include covering the site with asphalt and gravel to collect stormwater. Under a current use scenario, this pathway is considered insignificant. Under a future use scenario, this exposure pathway will be eliminated.
- Model results indicate that surface water quality standards will not be exceeded. Therefore surface water direct contact with dissolved compounds is not an exposure pathway of concern.
- In the LNAPL sample, only one compound was detected and at a concentration below the non-residential used aquifer soil to groundwater pathway MSC (used for screening purposes). Though the chemical composition of the LNAPL does not pose a threat to human health or the environment, the physical discharge of the LNAPL is considered a complete pathway.
- Evaluation of exposure to soil by way of direct contact (ingestion and inhalation) during construction indicates that benzene and arsenic were detected above the calculated exposure concentrations. Though this is considered a complete exposure pathway, it is not a chronic exposure and will be addressed under a site-specific health and safety plan during construction. The risk-based target concentrations were calculated for the SVOCs with detection limits above the non-residential direct contact MSCs; the risk-based target calculations indicate exposure concentrations above the detection limits from the remedial investigation except for benzo (a) pyrene and bis (2-chloroethyl) ether. Potential exposure to site constituents during construction will be addressed in a site-specific health and safety plan for the site development.
- The evaluation of ecological receptors indicated that there is a lack of complete exposure pathways.

Based on the results of the remedial investigation and risk evaluation, the remedial actions planned for the site are:

1. Enhanced LNAPL recovery and seepage elimination with a barrier
2. Removal of impacted soil from around the seep near the top of the west bank of the berm
3. Passive vapor control beneath proposed occupied co-generation project buildings

4. Stormwater control and infiltration minimization

Currently, as part of the Comprehensive Remedial Plan for the Marcus Hook refinery, LNAPL is recovered from all wells with recoverable LNAPL on Phillips Island. The planned remedial actions will enhance LNAPL recovery by installation of a series of recovery wells in the berm along the bank of the Delaware River. To eliminate seeps, a barrier, such as sheet pile, will be placed in the area of the seeps along a portion of the western bank of Phillips Island. LNAPL adjacent to the barrier will be removed with the enhanced recovery system. Interim measures, consisting of maintenance of a floating boom and absorbent in the area of the seeps, will be implemented to prevent the migration of LNAPL to the river. The boom will be maintained during the installation of the barrier and after LNAPL residuals riverside of the barrier have dissipated. Impacted soil around the seep near the top of the west bank of the berm will be removed to eliminate the direct contact exposure pathway.

The co-generation plant will be designed to eliminate potential exposure routes of constituents of concern resulting from historic land uses. Pathway elimination will include a vapor control system beneath all buildings that will be occupied by workers. The ground surface will be covered with either gravel or asphalt to remove the potential for worker and ecological receptor direct contact with surface soil. Stormwater will be collected by overland flow and subsurface drains and channeled to the plant cooling towers which will substantially minimize the potential for infiltration while minimizing the use of potable water for non-contact cooling.

These actions will eliminate exposure pathways (direct contact and inhalation) and mitigate potential migration of compounds detected at the site.

1.0 INTRODUCTION

Sunoco, Inc. (R&M) (Sunoco) retained URS/Dames & Moore to perform a site characterization, remedial investigation and risk assessment and develop a cleanup plan for the Phillips Island site at the Sunoco Marcus Hook refinery. The purpose of the remedial investigation was to characterize site environmental conditions and obtain information for assessing the potential risk to human health and the environment. The scope of the site characterization, remedial investigation, risk assessment and cleanup plan was consistent with the intent and requirements of the Pennsylvania Land Recycling and Environmental Remediation Standards Act (commonly referred to as Act 2). The results of these evaluations demonstrate that the site meets the Act 2 requirements for closure of the site under site-specific standards by engineering controls for pathway elimination. Many of the regulated substances were below the statewide health standards. This report presents the findings of the site characterization, remedial investigation and the risk assessment and a cleanup plan for the Phillips Island site.

Section 2.0 provides background, site history and a description of the current and planned use. Field activities are described in Section 3.0. The results of the investigation are discussed in Sections 4.0 (Physical Characteristics) and 5.0 (Chemical Characterization), respectively. Section 6.0 presents the results of the fate and transport modeling. Section 7.0 presents the risk evaluation. The cleanup plan is described in Section 8.0. The final sections are references (9.0) and signatures (10.0).